

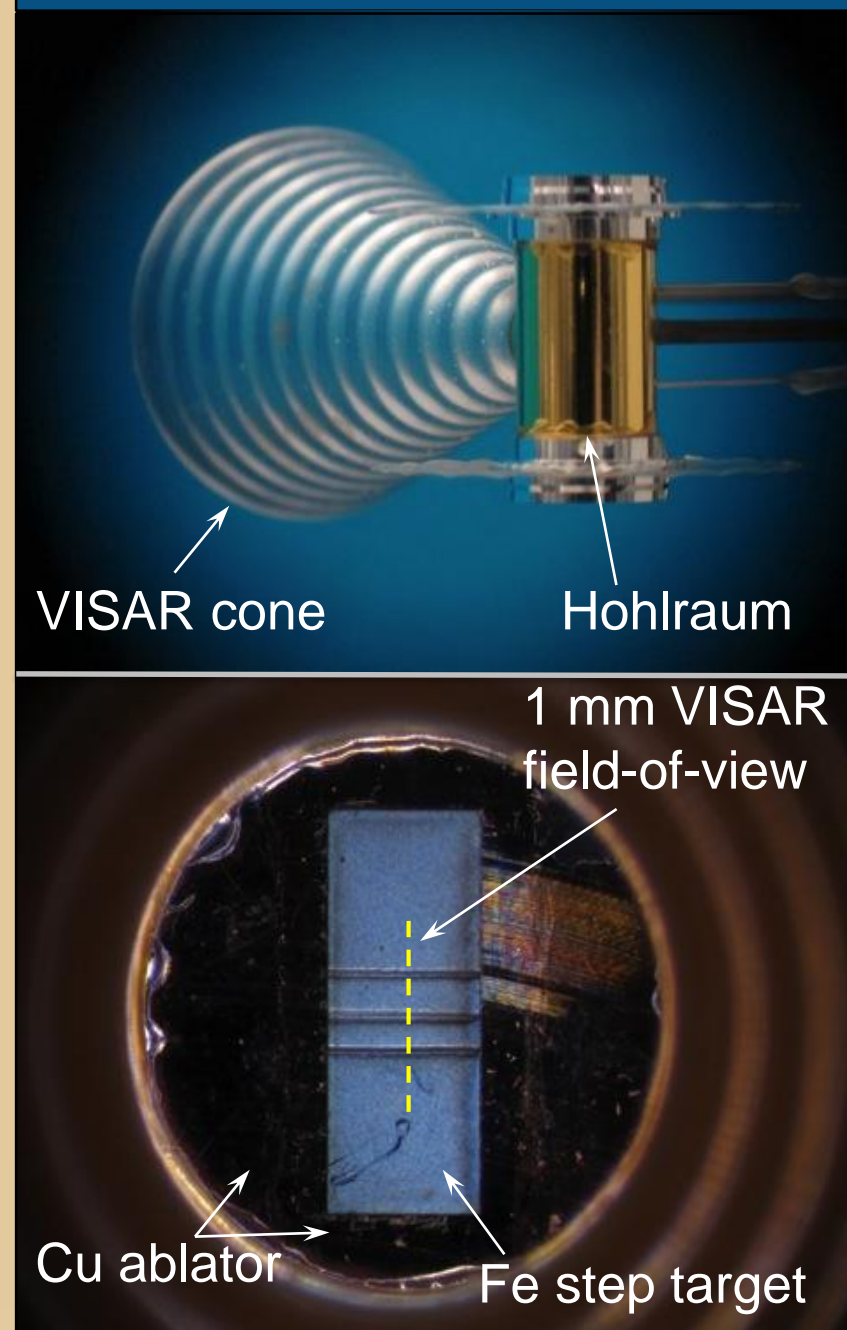
Sub-Micron Glue Bond

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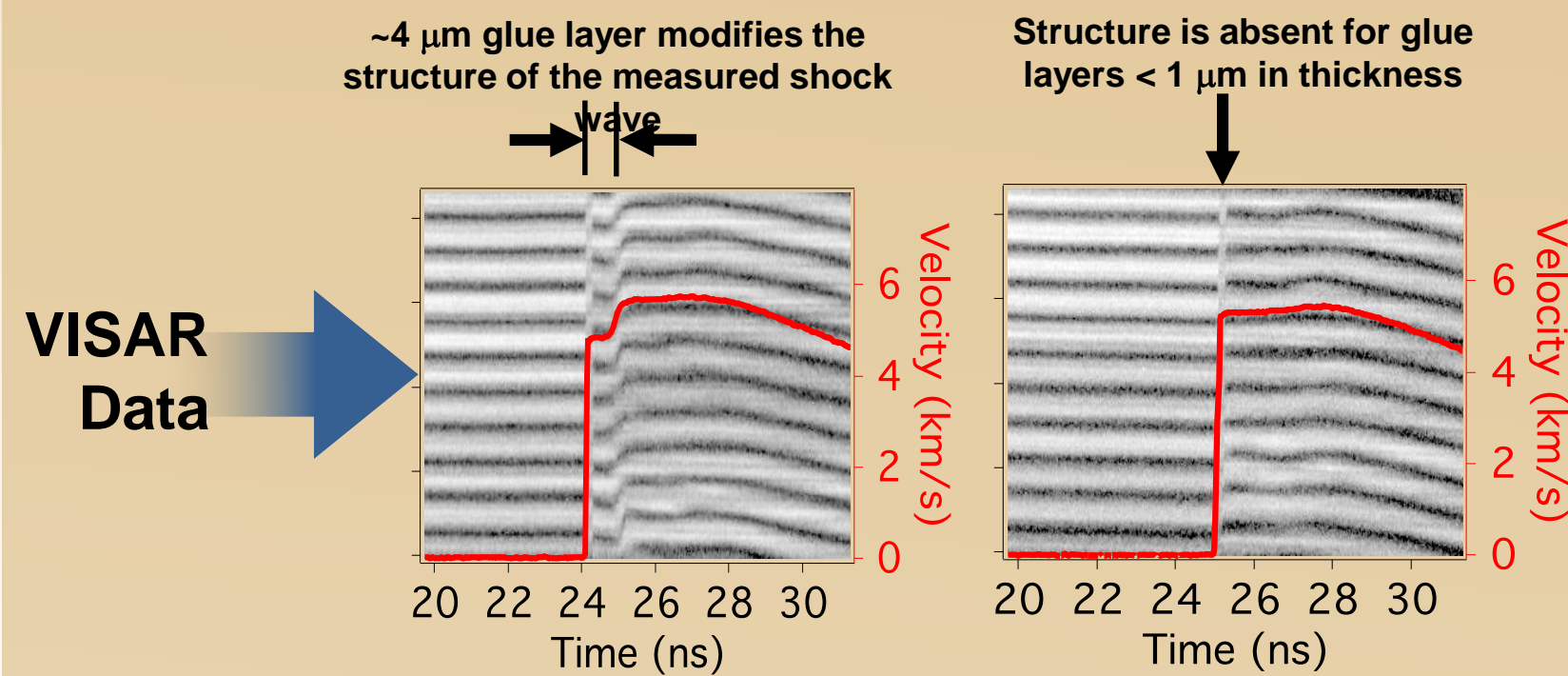
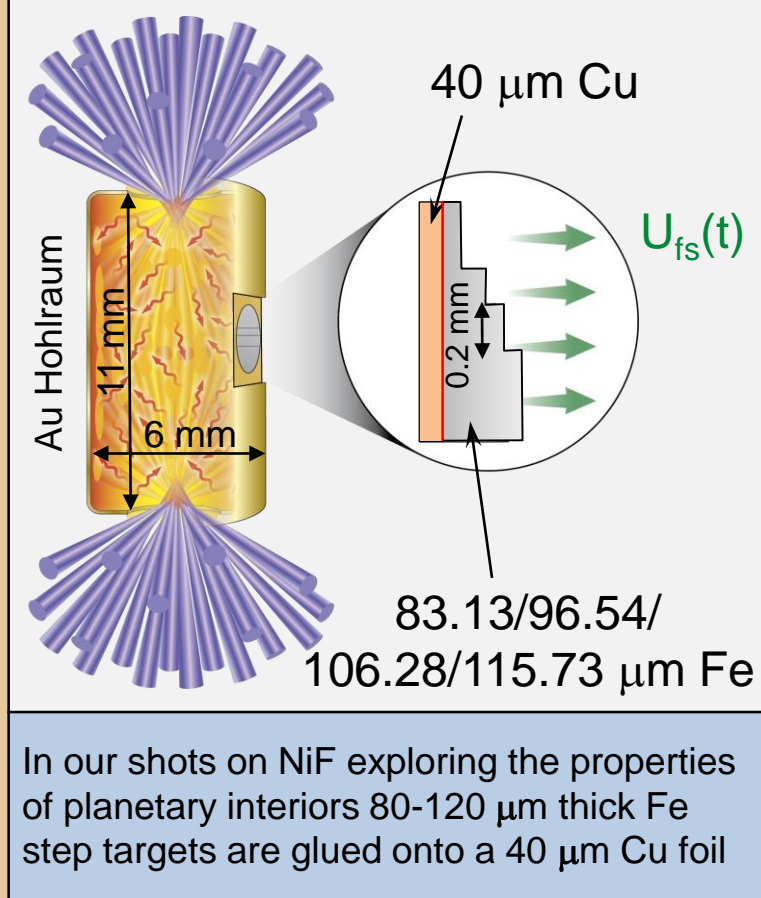
Glue layer thicknesses have a large effect on laser based Material Science Experiments

In experiments on the National Ignition Facility researchers use temporally-shaped laser pulses to recreate pressures within planetary cores. Under these conditions material properties are measured (density, sound speed, crystal structure). Different sample layers are bonded together with glue. The glue thickness directly impacts the uncertainty within the measurement.

Photos from a NIF target



Schematic of NIF target design



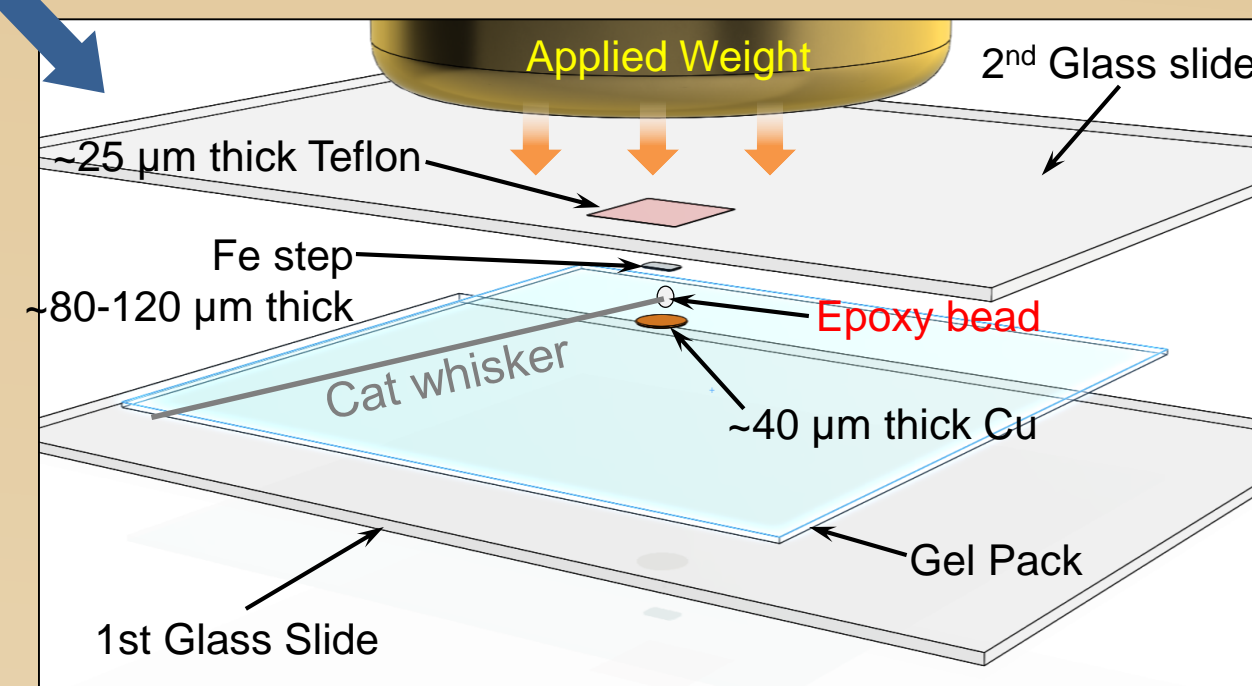
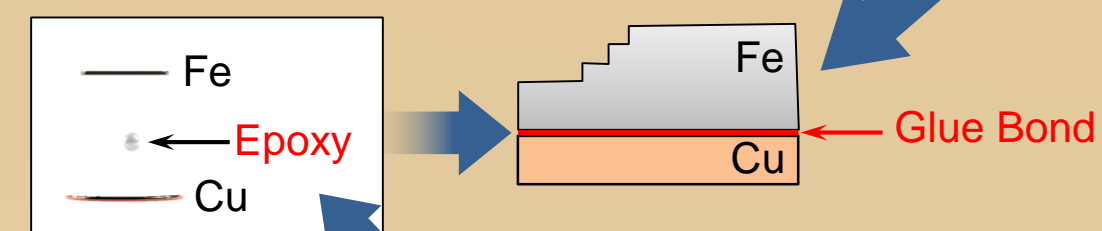
Technique for minimizing glue layer

MICRON GLUE BOND METHOD

- Place part Cu onto the center of Gel Pak, using vacuum chuck (see part a)
- Apply epoxy with cat whisker, or small hair part (see part a)
- Spread epoxy with clean room foam swab (see part b)
- Place part Fe on top of the epoxy (see part c)
- Align and press with clean room foam swab
- Place Teflon film over the top of the parts
- Place Gel Pak on top of the 1st glass slide (see below)
- Place 2nd glass slide on top of the Gel Pak (see below)
- Set weight 500g-1kg on top of the glass slide in the center
- Leave on until epoxy has cured
- Completed planar Ablator assembly (see part d)

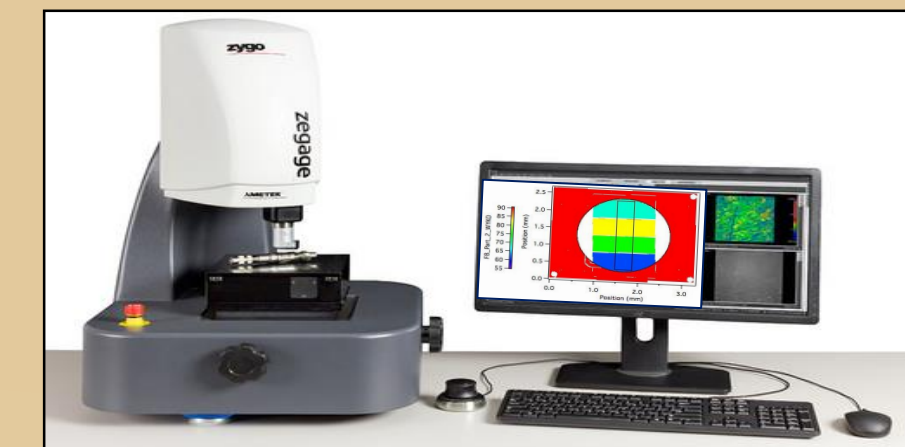
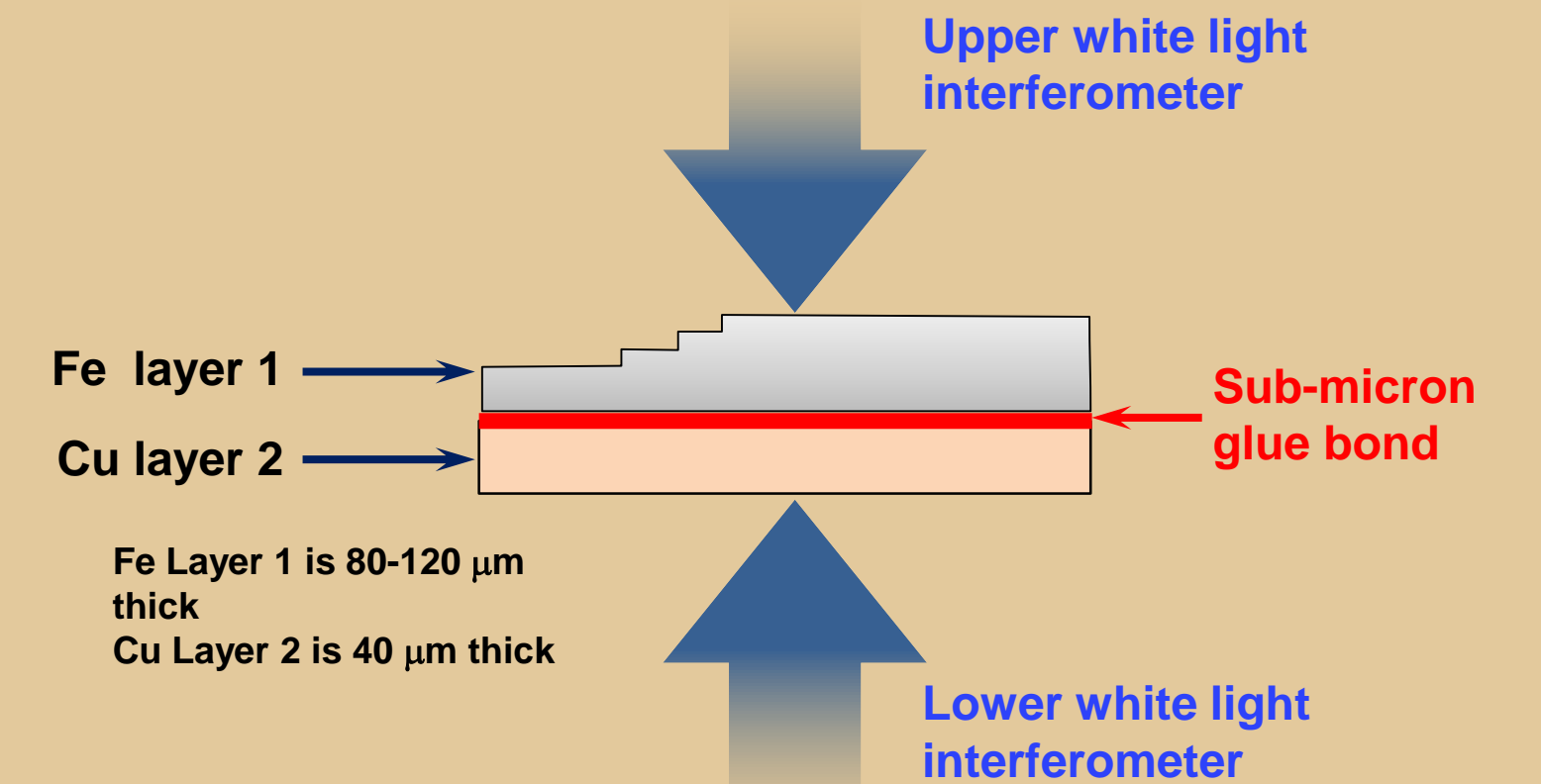
GENERAL INFORMATION

- Measurements can be taken with an HEIDENHAIN with accuracy to 0.5+μm
- Measurement for the NIF Ablators is taken using the Double Sided Interferometer accuracy to 0.1μm
- Targets for LCLS, MEC, JLF, OMGEA, and NIF have been assembled using this method
- Technique can be used to make 20 Planar Ablator type targets at a time
- Thousands' of Planar Ablator targets have been assembled using this process
- The thickness of the material ranges from 3μm to 1mm
- The parts dimensions' averages 2x2mm -3x3mm
- Many types of materials are used Qtz, Diamond, MgO Forsterite, LiF, Al foil, Au foil, Cu foil, Fe foil, Pt foil and Pb foil, just to name a few



Metrology – Glue thickness determination to 0.1 μm

We use double-sided white light interferometer to measure each layer thickness of the target individually and after the glue layer has been applied. This enables the final glue layer thickness to be measured to sub-micron accuracies.



Example of double sided Interferometer Data

